

BACKGROUND

PROJECT REVIEW AND APPROVAL

Project Team

## SLAVE RIVER HYDROELECTRIC PROJECT

Preliminary Identification of

Environmental Issues





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Under Authority of  
Honourable R. Nerysoo,  
Minister

19 October 1982

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## ~~SAUS RIVER HYDROELECTRIC PROJECT~~

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#### 1.0 PROJECT REVIEW AND APPROVAL

This hydro-electric project will be subject to both a federal environmental assessment review process (EA) and a provincial review, however, only one environmental impact statement (EIS) will be prepared by the proponent.

The following sections are intended to provide guidance on the



## **SLAVE RIVER HYDROELECTRIC PROJECT**

### Preliminary Identification of Environmental Issues

#### **1.0 PURPOSE OF BRIEF**

The purpose of this brief is to:

- 1) Outline the environmental reviews and approval process associated with the project;
- 2) Give a general description of the proposed project; and
- 3) Identify potential downstream impacts which the project may have on the Northwest Territories.

#### **2.0 BACKGROUND**

A feasibility study was initiated by the Alberta Cabinet in 1978, to determine the technical and economic feasibility of a hydro-electric project on the Slave River. This study also attempted to identify probable environmental and socio-economic effects associated with such a project.

The Alberta Government recently announced that a hydro-electric project on the Slave River is considered both technically feasible and economically attractive, and that they intend to proceed with more detailed engineering, environmental and socio-economic studies at the project site.

#### **3.0 PROJECT REVIEW AND APPROVAL**

The Slave River hydro-electric project will be subject to both a federal environmental assessment review process (EARP) and a provincial review. However, only one environmental impact statement (EIS) will be produced by the proponent.

The federal review was initiated by Parks Canada's concern over the

potential environmental impacts upon Wood Buffalo National Park. A federal EARP panel, consisting of five members has been struck and draft guidelines for the EIS released for review and comment by interested parties. The panel includes one representative from the Northwest Territories, one representative from Federal Government and three representatives from Alberta.

Public meetings have been held in Yellowknife, Fort Smith, Fort Resolution, Fort Chipewyan and Edmonton during October, 1982 to obtain input for the EIS guidelines. The issues which the federal review will address include:

- 1) Project justification;
- 2) Downstream environmental impacts on the Northwest Territories;
- 3) Native people;
- 4) Wood Buffalo National Park;
- 5) Peace-Athabasca delta;
- 6) Fish; and
- 7) Hydro-electric power for the N.W.T.

The procedures, mechanisms and timing of the Alberta environmental review are presently being clarified and will be announced in the near future. It is expected, however, that the provincial review will occur after the federal EARP is completed and that all concerns from the Northwest Territories, federal jurisdictions, Saskatchewan and Alberta will also be addressed in the provincial hearings.

#### **4.0 PROJECT TIMING**

Construction of the project could begin as early as 1985, if regulatory approvals are granted. Power generation from the project is anticipated to begin in the early 1990's.

## **5.0 PROJECT DESCRIPTION**

The proposed Slave River hydro-electric project will affect an area encompassing parts of northeastern Alberta and southern Northwest Territories (Figure 1). Potential environmental effects of the project will range from Lake Athabasca to Great Slave Lake. Depending upon the final site selection and powerhouse operating scheme, the Mackenzie River may also be affected.

Project construction will cost approximately 2.0 billion 1980 dollars but could escalate to nearly 8.0 billion dollars by the mid-1990's. The feasibility study has covered two basic alternatives for a run-of-the-river hydro-electric project design:

- 1) A damsite-powerhouse near Fort Smith; or
- 2) A damsite-powerhouse near Fort Smith with a control structure on Riviere des Rochers to allow for partial regulation of Lake Athabasca water levels and outflows.

The first alternative considers three damsite locations; Mountain Rapids, Alternative 4 and Rapids of the Drowned (Figure 2), all of which are technically and economically feasible. The powerhouse, at any of the above damsites, would contain 12 generating units with a combined installed capacity of approximately 1800 megawatts. One should note, however, that the Rapids of the Drowned site is located within the Northwest Territories, whereas the other two are located in Alberta.

The second alternative considers, in addition to the damsite-powerhouse, the use of a control structure to delay some water outflow from Lake Athabasca during the spring and summer seasons. Additional water will be released in the winter, when natural water flows are low, to increase power generation.

A run-of-the-river hydro-electric project does not require the high water storage capacity which is generally needed by other types of large-scale hydro-electric projects. A small water storage capacity will be available,

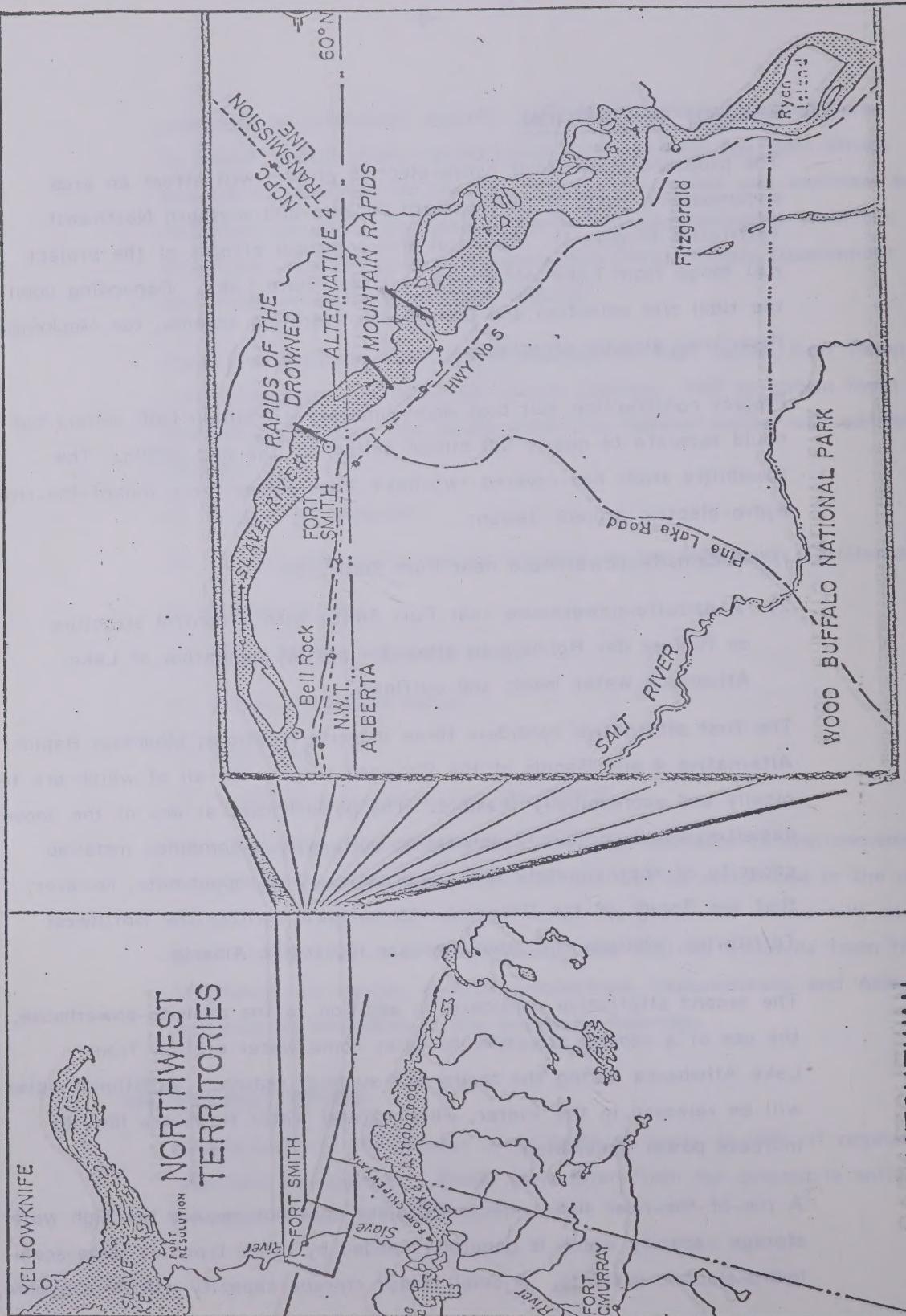


FIGURE I - SLAVE RIVER HYDRO - PROJECT LOCATION

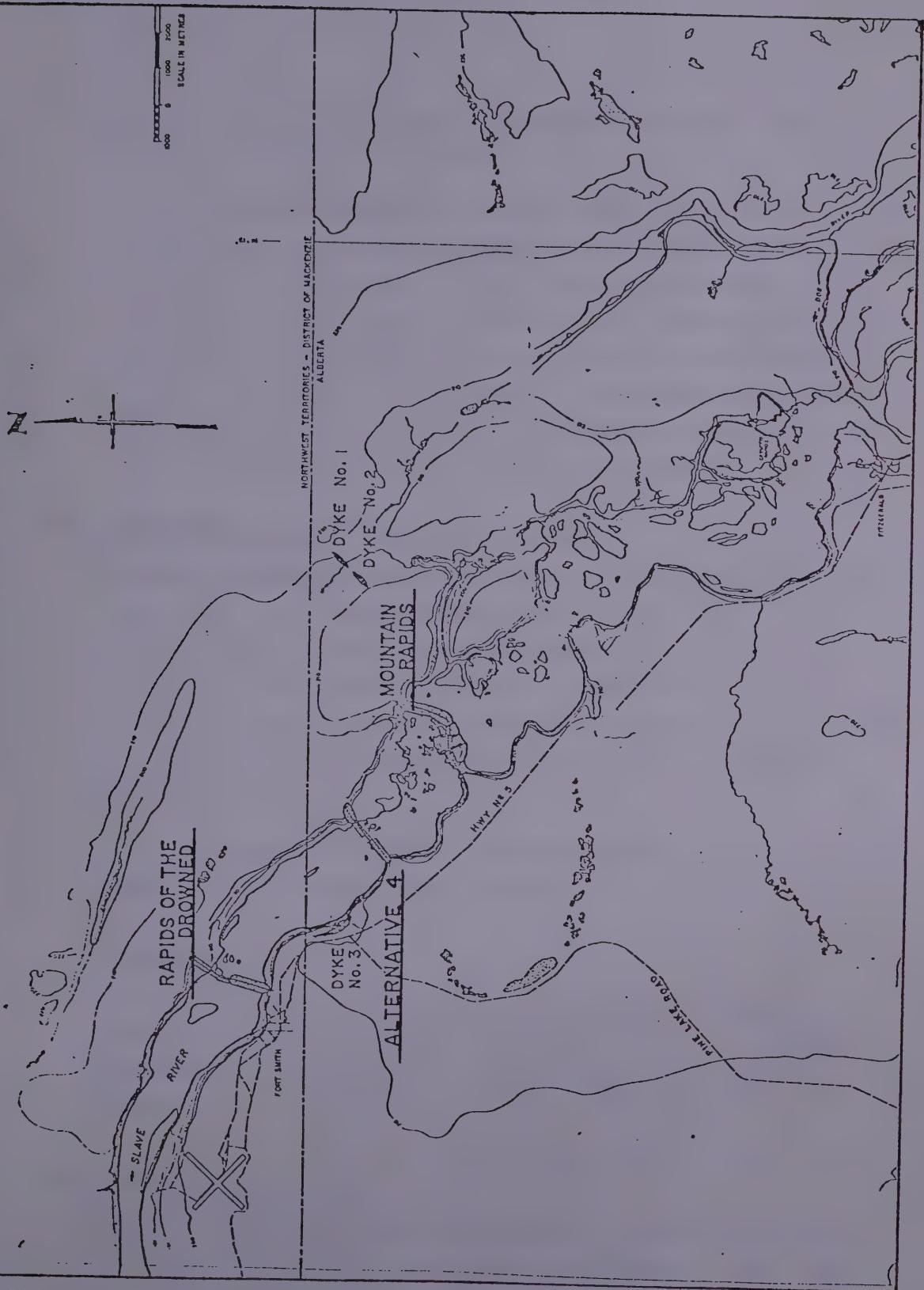


FIGURE 2 DAM AND POWER SITE LOCATIONS



but the amount of power generation available will depend on the day-to-day flow of the Slave River.

Several options are available for the daily power plant operation. The most likely one is to operate the plant at full capacity by using up to 6000 cubic metres per second ( $m^3/s$ ) of water for several hours during the daily period of high power consumption. For the remainder of the day, the plant would reduce its water use to approximately 1000  $m^3/s$ . The above type of operation will result in a large daily fluctuation of water releases from the powerhouse and subsequently, alterations to the river water levels, immediately downstream of the plant.

## **6.0 DOWNSTREAM ENVIRONMENTAL IMPACTS**

Feasibility studies have only identified some of the environmental impacts which may occur. The severity and extent of these impacts on the Northwest Territories will depend on the location of the damsite and the method by which the power plant is operated. Further environmental data will be required to fill the present knowledge gaps, and to adequately judge the significance of environmental effects within the Northwest Territories.

Project development will consist of three phases; dam construction, reservoir filling, and power plant operation.

### **6.1 Dam Construction**

Inclusion of and adherence to environmental protection clauses in construction tender and contract specifications will ensure that the downstream effects attributable to project construction activities will be minor and of short-term.

### **6.2 Reservoir Filling**

Reservoir filling is expected to be completed in a three-stage process, extending over three and one-half years. The amount of water flow reductions are not known at this time, but will depend on the following:



- 1) Water flow constraints imposed by the regulatory agencies, such as the federal Department of Fisheries and Oceans, and the Alberta Department of Environment;
- 2) Water flow in the Slave River during the filling period; and
- 3) Plant operations during the final filling stage.

It should be noted that a short period of complete water flow shut-off considered earlier in the feasibility study will now be avoided. Environmental concerns cannot be addressed adequately until the above water flow reductions are known.

### **6.3 Plant Operation**

The major environmental impacts occurring during plant operation, will result from daily downstream water fluctuations. Fish, wildlife, river bank stability, the Slave River Delta, and Great Slave Lake may all be affected by a peaking plant operation.

Fish will be affected by these fluctuations. Commercial fish species of the Great Slave Lake use shallow areas of the Slave River immediately downstream of the Rapids of the Drowned for spring and fall spawning. The spawning success of these fish could be adversely affected by frequent water level fluctuations below the damsite. Eggs deposited in areas of the river that become exposed due to water level fluctuations, will perish due to dessication and/or freezing.

Aquatic furbearers such as muskrat and beaver which inhabit the delta and oxbow lake areas along the Slave River may be affected. Mortality may intensify due to drowning in flooded dens and increased predation of those animals displaced from their dens.

River banks are presently susceptible to degradation and undercutting. It is expected that regular flow changes due to plant operation may accelerate this process and result in increased bank slumping and decrease river bank stability.



The biological-hydrological interaction of a delta is a very sensitive system. The Slave River Delta is no exception and any change to the hydrologic regime will have repercussions on the biology of the area. Adverse effects on the delta could unfavourably affect fish, both in the Slave River and in Great Slave Lake, waterfowl and wildlife.

Great Slave Lake is an oligotrophic lake (low in nutrients). The Slave River supplies approximately 85% of the total annual discharge into the lake, and also the majority of the nutrients. It is possible that a hydroelectric project with an impoundment could alter the nutrient input into the lake so as to lower its productivity. This implies that the fish of Great Slave Lake, which are relatively slow growing, may take an even longer period of time to reach a commercially viable size.

Daily flow fluctuations from the power plant may cause increased ice jamming during the winter and the subsequent overbank flooding, due to the ice jams, might influence local groundwater conditions. Overbank flooding may also occur in winter along the lower 15 km of the Salt River. This could result in some vegetational and wildlife habitat changes within that area. Bison which overwinter on the west side of the Slave River may be adversely affected by the flooding and vegetational changes indicated above.

Vegetational succession of plant species which grow along the river banks and islands could be affected as a result of altered surface and groundwater conditions induced by daily flow fluctuations. Ice buildup and scouring in the winter could also affect vegetational changes.

Finally, nitrogen gas supersaturation is a possibility during sustained periods of low power generation as air is vented into the turbines to reduce negative pressure. Nitrogen gas super-saturation is fatal to fish.



## **7.0 SUMMARY**

The environmental and engineering work to date has been of a preliminary nature. Until final engineering design, damsite location, power plant operating regime and results of detailed environmental investigations are known, it is not possible to fully evaluate the extent or seriousness of the impacts of the project upon the renewable resources of the area.

The major environmental issues and concerns as they pertain to the Department of Renewable Resources are as follows:

### Process Concerns

- 1) The need to ensure that adequate environmental studies using both quantitative and qualitative data will be carried out by the proponent to provide a foundation for impact predictions; and
- 2) Access and input to environmental reviews and negotiations to ensure that the environmental and socio-economic concerns relevant to the renewable resource users of the area are addressed.

### Ecological Concerns

- 1) Reduction of fish populations in the Slave River and Great Slave Lake;
- 2) Increased mortality of aquatic furbearers within the Northwest Territories as a result of the proposed project;
- 3) Alterations to the Slave River Delta which could unfavourably affect the ecological systems of the surrounding area;
- 4) Decreased nutrient input into Great Slave Lake;
- 5) Decreased river bank stability;
- 6) Increased winter overbank flooding; and
- 7) Riparian vegetation successional changes resulting in altered wildlife habitats.

The Department of Renewable Resources on behalf of the renewable resource users of the Northwest Territories will continue its review of the proposed Slave River project. This will include participation in the formal environmental impact assessment process and any necessary action within the mandate of the department, to ensure that the renewable resources of the area are protected.

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AUTHOR N.W.T. Dept. of Renewable  
Resources.

TITLE Slave River hydroelectric project  
: preliminary identification.

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